

Appl. No. 10/658,828
Docket No.: H1799-00210
Reply to Office Action of March 3, 2004

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A thermal energy management system comprising:

a planer heat pipe having a first outer surface spreading device that is operatively engaged with at least one heat generating component wherein said planar heat pipe is sized and shaped so as to spread thermal energy over an area larger than the area of said at least one heat generating component; and

a thermal bus that is operatively engaged with a second outer surface of said planer heat pipe spreading device so as to transport thermal energy from said planer heat pipe spreading device to a heat sink, said thermal bus including a tubular evaporator portion of a loop-thermosyphon.

2. (Cancelled)

3. (Original) A thermal energy management system according to claim 1 including a second thermal bus that is operatively engaged with said first thermal bus so as to transport thermal energy from said first thermal bus to a heat sink.

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4. (Original) A thermal energy management system according to claim 3 wherein said second thermal bus comprises a loop thermosyphon.

5. (Cancelled)

6. (Currently Amended) A thermal energy management system according to claim 1 wherein said planer heat pipe ~~spreading device~~ comprises a ~~planar heat pipe including~~ a vapor chamber that is defined between a top wall formed from a substantially uniform thickness sheet of a thermally conductive material and a bottom wall comprises a substantially uniform thickness sheet of a thermally conductive material.

7. – 8. (Cancelled)

9. (Currently Amended) A thermal energy management system according to claim 1 wherein said thermal bus comprises at least two ~~one~~ loop-thermosyphons that are is thermally engaged with said planer heat pipe ~~spreading device~~ so as to bus thermal energy to a thermal energy sink.

10. (Currently Amended) A thermal energy management system according to claim 1 wherein said thermal bus comprises a loop thermosyphon formed from a closed tube having a continuous internal passageway and wherein

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said tubular ~~at least an~~ evaporator portion includes ~~including~~ an integrally formed wicking layer disposed on the surface of said tube that defines said internal passageway adjacent to said evaporator portion and said planer heat pipe.

11. (Original) A thermal energy management system according to claim 10 wherein said wicking layer comprises sintered copper powder having an average thickness of about 0.5 mm to 2.0 mm.

12. (Currently Amended) A thermal energy management system according to claim 9 wherein said loop thermosyphon comprises a condensing portion positioned in spaced away relation to said tubular ~~an~~ evaporator portion.

13. (Original) A thermal energy management system according to claim 1 wherein a portion of said thermal bus is arranged in intimate thermal contact with a wall of a support chassis.

14. (Original) A thermal energy management system according to claim 13 wherein said thermal bus is maintained in position by a simple fastening system so that it may be disassembled from an underlying electronic system and components.

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15. (Original) A thermal energy management system according to claim 13 further comprising a second thermal bus positioned adjacent to a condensing portion of said thermal bus.

16. (Cancelled)

17. (Currently Amended) A thermal energy management system comprising:

a planer heat pipe heat spreader that is thermally engaged with at least one heat generating component; and

an evaporator plate positioned between a portion of said planer heat pipe heat spreader and an evaporation tube portion of a loop thermosyphon so as to transport thermal energy from said planer heat pipe heat spreader to a heat sink.

18. (Currently Amended) A thermal energy management system according to claim 17 wherein said evaporator plate provides a physical and thermal interface between a top wall of said planer heat pipe heat spreader and said evaporator tube portion of said loop-thermosyphon.

19. (Original) A thermal energy management system according to claim 17 wherein said evaporator plate is formed from a substantially uniform

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thickness sheet of a thermally conductive material that is sized and shaped to cover a portion of said top wall.

20. (Currently Amended) A thermal energy management system according to claim 19 wherein ~~said~~ at least one groove is formed in a top surface of said evaporator plate so as to receive and cradle said evaporator tube ~~portion~~ of said loop-thermosyphon.

21. (Currently Amended) A thermal energy management system comprising:

a planer heat pipe heat spreader that is operatively engaged with at least one heat generating component;

an evaporator plate positioned between a portion of said planer heat pipe heat spreader and an evaporation tube ~~portion~~ of a first loop thermosyphon so as to transport thermal energy from said planer heat pipe heat spreader to a heat sink; and

a second evaporator plate positioned between a condensing portion of said first loop thermosyphon and an evaporator tube ~~portion~~ of a second loop thermosyphon.

22. and 23. (Cancelled)

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24. (Currently Amended) A method of managing thermal energy
in an electronic system comprising:

vaporizing a two-phase liquid within a chamber with thermal energy
generated by one or more devices;

spreading said thermal energy ~~generated by one or more devices~~ over a
surface that is relatively larger than said devices;

thermally coupling an evaporator tube ~~portion~~ of a loop thermosyphon to
said surface; and

thermally coupling a condensing portion of said loop thermosyphon to a
thermal energy sink.

25. (Currently Amended) A method of managing thermal energy
in an electronic system comprising:

vaporizing a two-phase liquid within a chamber with thermal energy
generated by one or more devices;

spreading said thermal energy ~~generated by one or more devices~~ over a
surface that is relatively larger than said devices;

thermally coupling an evaporator tube ~~portion~~ of a loop thermosyphon to
said surface; and

thermally coupling a condensing portion of said loop thermosyphon to an
evaporator tube ~~portion~~ of a second loop thermosyphon.

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26. (New Claim) A thermal energy management system comprising:
- a planer heat pipe that is operatively engaged with at least one heat generating component wherein said planar heat pipe (i) encloses a two-phase vaporizable liquid serving as a working fluid, and (ii) is sized and shaped so as to spread thermal energy over an area larger than the area of said at least one heat generating component;
 - an evaporator plate having a bottom surface thermally engaged with said planar heat pipe and a top surface having at least two grooves; and
 - a thermal bus including at least two tubular evaporators of a loop-thermosyphon wherein each of said tubular evaporators is received in, and thermally coupled to one of said at least two grooves so as to transport thermal energy from said evaporator plate and said planar heat pipe to a heat sink.